ENGINEERING MECHANICS

I Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A5ME01	ESC	3	1	-	4	30	70	100

COURSE OBJECTIVES:

The course should enable the students to:

1. Resolve various force systems and calculate reactions of various supports on rigid bodies in equilibrium
2. Analyze the frictional forces of rigid bodies on rough horizontal and inclined planes.
3. Evaluate Geometric properties of composite areas and solids.
4. Analyze rigid bodies in motion, work-energy problems and their relationship to engineering applications
5. Develop mathematical model of dynamic systems subjected to simple harmonic motion.

UNIT-I	INTRODUCTION TO ENGINEERING MECHANICS & EQUILIBRIUM OF PLANAR SYSTEM OF FORCES

Introduction to engineering mechanics: Basic concepts, Classification of a force system, Parallelogram law, Resultant of coplanar concurrent force system, Moment of a force, its applications, Varignon's theorem, Resultant of coplanar non-concurrent force systems, Couples.

Equilibrium of Planar System of forces: Equilibrium, Conditions of equilibrium, Lami's theorem, free body diagrams, Types of supports, their reactions, Analysis of beams.

UNIT-II	ANALYSIS OF PERFECT FRAMES & FRICTION

Analysis of perfect frames: Types of frames, Method of joints and Method of Sections

Friction: Introduction, types of friction, laws of friction, coefficient of friction, angle of friction, angle of repose, analysis of bodies on rough horizontal, inclined planes, wedge friction, ladder friction and screw friction

UNIT-III	CENTROID, CENTRE OF GRAVITY & MOMENT OF INERTIA

Centroid & Centre of gravity: Introduction, centroids & centre of gravity of simple figures (from first principles), centroid of composite sections, centre of gravity of composite solids, theorems of pappus&guldinus.

Moment of Inertia: Area moment of inertia of plane sections (from first principles), Parallel axis theorem, Perpendicular axis theorem, Moment of inertia of standard sections and composite sections.

UNIT-IV	KINEMATICS & KINETIC

Kinematics of a particle: Rectilinear motion, curvilinear motion, direct and oblique impact.

Kinetics of rigid bodies: Analysis of connecting bodies,kinetics of rigid body rotation, D' Alembert's principle, work-energy theorem, impulse-momentum principle, their applications

UNIT-V	VIRTUAL WORK & MECHANICAL VIBRATIONS

Virtual work: Concept of virtual work, Principle of virtual work, its applications

Mechanical Vibrations: Basic terminology, free and forced vibrations, resonance, simple harmonic motion, simple, compound and torsional pendulums.

Text Books:

1. Khurmi, R.S. A Text book of Engineering Mechanics
2. Bansal R.K, A Text book of Engineering Mechanics, Laxmi Publications

Reference Books:

1. Singer, Engineering Mechanics : Statics & Dynamics
2. Timoshenko, Engineering Mechanics

COURSE OUTCOMES:

At the end of the course the student should be able to:
1. Evaluate magnitude, direction and position of resultant of different system of forces.
2. Analyze of forces in members and concept of friction
3. Calculate centre of gravity and moment of inertia of plane areas and composite bodies.
4. Analyze general plane motion for particle and rigid bodies
5. Assess virtual work and basic mechanical vibrations